

Unit 2

Handling of Tools and Equipment

INTRODUCTION

When you work with appliance repair, you need to be familiar with working of the tools. You may already be familiar with the typical wrenches and screwdrivers, but you will need to know more, such as about voltage meters and even single and multiphase compressor testers. Therefore, it is necessary to be sure that you are equipped with enough knowledge to properly use the tools that will be needed. Always remember to take them when you are working on a job.



Fig. 2.1 Tools used in electricity

Various tools and equipment are required for maintaining as well as erection of various electrical components (Fig. 2.1). Therefore, it is necessary to know about various tools and equipment to operate them safely.



Fig. 2.2 Screwdriver



Fig. 2.3 Types of screwdrivers

SESSION 1: TOOLS AND EQUIPMENT

The various tools and equipment used by an electrical or electronic technician while working with electrical circuits are explained below:

(a) Screw driver: It is used to turn, tighten or remove screws (Figs. 2.2 and 2.3).

(b) Ratchet: It is used to allow rotary motion in only one direction and preventing the motion in opposite direction. It is used to tighten nuts of various sizes (Fig. 2.4).

(c) Spanner: It is used to provide grip to apply torque for turning objects such as nut or a bolt. A spanner is available with variable diameter to tighten nuts and bolts of various sizes (Fig. 2.5).

(d) Wrench: It is a hand tool used for tightening and loosening of the nuts and bolts (Fig. 2.6). These tools hold slippery or small nuts and bolts for loosening or tightening it.

(e) Wire cutter and Plier: A wire cutter is used for stripping and cutting wires whereas a plier is used to hold objects like nuts and bolts firmly also used for cutting metal wires (Fig. 2.7).

(f) Tester: It is used to verify the presence of electric voltage in electrical equipment (Fig. 2.8).

(g) Hammer: It is used to fix nails in walls and wood, fit parts, or forge metal and breaking different materials (Fig. 2.9).

(h) Ladder: It is used to climb upwards to reach higher places (6 to 7 feet) in tall units of a control panel (Fig. 2.10).

(i) Utility Knife: It is used to cut various objects, such as wires, cords, tapes and so on (Fig. 2.11).

(j) Soldering or Desoldering Iron: It is used to embed/remove the components on/from the panel (Fig. 2.12).

(k) Soldering or Desoldering Station: It is used to hold the hot iron when it is not in use and adjust the temperature of the tip (Fig. 2.13).



Fig. 2.4 Ratchets



Fig. 2.5 Spanner



Fig. 2.6 Wrench



Fig. 2.7 Wire cutter and plier



Fig. 2.8 Tester



Fig. 2.9 Hammer



Fig. 2.10 Ladder



Fig. 2.11 Utility knife



Fig. 2.12 Soldering or desoldering iron



Fig. 2.13 Soldering or desoldering station



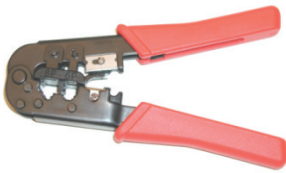


Fig. 2.14 Crimping tool



Fig. 2.15 Voltmeter



Fig. 2.16 Ammeter



Fig. 2.17 Watt meter



Fig. 2.18 Megger



Fig. 2.19 Multimeter

(l) Crimping Tool: It is used to cut various objects such as wires, cords, tapes and so on. It is also used to join wires with metal or plastic objects (Fig. 2.14).

(m) Voltmeter: It is used to measure potential difference between two points in the electric circuit (Fig. 2.15).

(n) Ammeter: It is used to measure current flow in a circuit (Fig. 2.16).

(o) Watt meter: It is used to measure electrical power of any given circuit (in watts) (Fig. 2.17).

(p) Megohmmeter or Megger: It is used to measure leakage in wires and earth resistance (Fig. 2.18).

(q) Multimeter: It is used to measure various electrical quantities like resistance, voltage, current, etc (Fig. 2.19).

Check Your Progress

A. Fill in the blanks

- _____ is used to allow rotary motion in only one direction. It is used to tighten nuts and bolts.
- Crimping tool is used for joining wires with _____ or _____ objects.
- In an electric tester _____ bulb is used.

B. Identify whether the following statements are True or False

- Always examine the tool for damages before use.
- It is OK to wear loose clothing, dangling objects and jewellery using hand tool.
- Keep cords and hoses away from heat, oil and sharp edges.
- Before connecting any electrical equipment to a power source, make sure the power is on.

C. Short answer questions

- Can a wire cutter be used in place of a plier? Explain in brief.
- How do tools and equipment help ease an electrical technician's work?



SESSION 2: TOOLS AND EQUIPMENT USED FOR CABLE LAYING

Preparations of Cables and Equipment for Cable Laying Activities

Tools and equipment are used for various electrical activities. We should take care while handling the electrical wire laying. While laying the cables necessary precautions and health and safety practices for power related work should be observed as per standard rules. Important tools and equipment used for laying electrical wire (laying works) are given here.

Tools and Equipment used in Cable Laying Activities

Many tools are used for cable laying. These include cable pulling winch, cable guiding device and cable pulling grip, etc.

Cable Drums

Cable gets twisted during laying process. Drums are used to check or avoid twisting of cables. Cable drums (Figs 2.20 and 2.21) help the technicians with the laying of cables. Similarly angle rollers are also used for laying the cable (Fig. 2.22).

Pulling Methods and Calculations

Proper methods should be used while laying the cable in the field. Suitable equipment and tools must be used in this process. The cable drum should be mounted on jacks and the cable should be rolled off the drum gently avoiding kinks and twists. The free end in the case of heavy cables may be pulled with the help of a winch. Laying cable in an open trench presents no serious difficulty. The cable is first placed on rollers laid in the trench or on the ground above, which is then transferred to the bed of the trench. When laying cables in pipes and ducts, care should be exercised so as not to damage them during installation. The correct method of laying of cables for installation in a duct is shown in Fig. 2.23.

HANDLING OF TOOLS AND EQUIPMENT



Fig. 2.20 Cable drum with cable



Fig. 2.21 Cable drum without cable



Fig. 2.22 Angle rollers

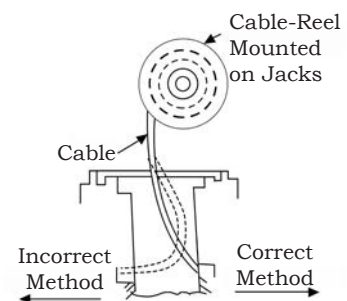


Fig. 2.23 Pulling Methods



Testing of Underground Cables

After laying cables underground or above the ground, proper testing is done to check the faults caused, if any, due to the laying. The cables are tested for short circuiting faults, discontinuity faults and earth fault. Murray and Varley loop tests are done to check these faults.

Tools Used for Erection and Maintenance

A lineman who is doing erection and maintenance work, cannot do his job without proper hand tools, which he carries around on a daily basis. Unlike tools used by any other worker, a lineman's tools require proper insulation, because these tools are used with electrical installations. The handles of these tools are coated with rubber to prevent the worker from getting electrocuted (Fig. 2.24).

Tools are important to carry out a job. The entire job being carried out by a technician is with the help of tools. The following tools are commonly used for working in a distribution system:



Fig. 2.24 Tools for erection and maintenance



Fig. 2.25 Combination plier

(a) Combination Pliers

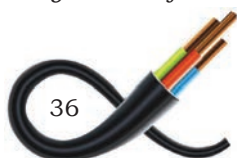
It is used for cutting, removing insulation, jointing and twisting the electric wires and cables even on live-line. A lineman's pliers have special design, which multiplies force through leverage. These pliers usually have grips for better handling than bare metal handles. The grips also have insulation for protection against electric shock when working with live circuits. A lineman's pliers are typically machined from forged steel. The two handles are precisely joined with a heavy-duty rivet that maintains the pliers' accuracy even after repeated use under extreme force on heavy-gauge wire (Fig. 2.25).



Fig. 2.26 Adjustable wrench

(b) Adjustable Wrench

It is used to open and close nuts and bolts in case of proper size spanner not being available. Common sizes are 8" (Inch) to 12" (Inch). Adjustable wrenches are designed to provide a wide range of capacity in a single tool and are a convenient service wrench for



distribution linemen. They are not intended to replace fixed opening wrenches for production or general service work. High dielectric insulated handle types are widely used by linemen and other electrical workers (Fig. 2.26).

(c) Pipe Wrench

It is used to open, close, conduit GI pipes and valves. Common size is 10" (Inch). The design of the adjustable jaw allows it to lock in the frame, such that any forward pressure on the handle tends to pull the jaws tighter together. They are usually made of cast steel. Nowadays, aluminium is also used to construct the body of the wrench, while the teeth and jaw remain steel (Fig. 2.27).



Fig. 2.27 Pipe wrench

(d) Measuring Tape

It is used to measure the length of wires, cables and space. Use of measuring tape makes cable savings efficient for cleaning and reduces wastage. These are made of cotton or metal strips bearing size of 10' (feet) to 100' (feet) (Fig. 2.28).



Fig. 2.28 Measuring tape

(e) Hammer

It is used to pierce nails, centre punch, rawl plug and chisel. Common sizes are 1, 2.5, 3 and 5 lbs (Pounds). A lineman's hammer is best suited to driving in big lag screws and hammering bolts in utility-pole work. They are also used by electricians to drive nails in hard places (Fig. 2.29).



Fig. 2.29 Hammer

(f) Ratchet with Drill Bit (Hand Drill)

It is used to make holes on wooden cross arms and wooden cleats for tight fitting High Tension and Low Tension cables emanating from DP structures, or LT transformer bushings (Fig. 2.30).



Fig. 2.30 Ratchet with drill bit (hand drill)

(g) Electric Drill Machine

It has the below mentioned properties:

- It is a portable electric powered tool used for drilling the surface (Fig. 2.31).
- It has a high speed motor to revolve the chuck.
- It is used to make holes smoothly and easily.



Fig. 2.31 Electric drill

(h) Bench Vice

A vice is a mechanical apparatus used to secure an object to allow work to be performed on it. In electrical



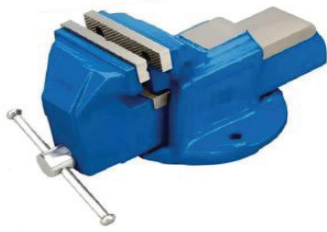


Fig. 2.32 Bench vice



Fig. 2.33 Chain pulley



Fig. 2.34 Tripod



Fig. 2.35 Come along clamp



Fig. 2.36 Ratchet device



works, cutting does play an important role. Cutting an electrical conduit has to be secure enough so that a smart cut is made. A bench vice (Fig. 2.32) is a perfect way to do this. Bench vice is used to grip the job (object) which has the following features:

- Base Plate (permanently fixed on the working table sides).
- Fixed Jaw (fixed with Base Plate)
- Moving Jaw (could be moved according to the thickness of job)

(i) Chain Pulley

It is a pulley with depressions in the periphery of its wheel, or projections from it, made to fit the links of a chain. The desired capacity chain pulley is hooked at the centre to lift heavy load for loading and unloading at site (Fig. 2.33).

(j) Tripod

It is a combination of three to four meter long 40 mm GI pipes hinged at upper end for making a tripod formation. Tripods are perfect for utility workers as they are portable and lightweight with high-strength anchor (Fig. 2.34).

(k) Come Along Clamp

It is used while laying overhead lines. These are mainly used for holding conductors and ground wires in overhead transmission lines and various other industrial maintenance operations. These clamps are available in multiple diameter, weight and design that are ideal to use in electrical works. They are ideal to pull conductors as they are lightweight and compact in structure (Fig. 2.35).

(l) Ratchet Device

It is a device consisting of a bar or wheel with a set of angled teeth in which a pawl, cog, or tooth engages, allowing motion in one direction only. Ratchets are widely used in machinery and tools as well as maintenance works (Fig. 2.36).

The senior lineman normally works in a distribution sub-division of a Power Company (Discom). The recommended norms for tools and equipment for a

distribution sub-division are almost same for all states. Electricians working in the field must have the following tools with them as given in Table 2.1.

Table 2.1 List of standard tools for an electrician

S. No.	Particulars	Quantity
1.	Chain pulley block (5 MT)	1
2.	Megger (1000 volts)	1
3.	Earth Tester	1
4.	Portable Drilling Machine	1
5.	Bamboo Ladder	2
6.	Steel Measuring Tape	1
7.	Pulling and lifting machine 3 tone	1
8.	Pipe wrench 3"(7.6 cm)	2
9.	Spirit Level	4
10.	Socket Spanner Set	2
11.	Ring Spanner Set	2
12.	Hammer	2

Fault Indicators and Protective Equipment

The flow of current towards an undesired path or abnormal stoppage of current is termed as fault. Fault indicators (Fig. 2.37) are devices which indicate the passage of fault current. When properly applied, they can reduce operating costs and reduce service interruptions by identifying the section of cable that has failed.



Fig. 2.37 Fault indicator

Dos and Dont's while Working

1. Never touch a current carrying wire or conductor.
2. Never pull out a flexible cable while removing the plug from the mains.
3. Switch off the supply while checking any electrical appliance.
4. Never play with tools.
5. Handle tools carefully and be alert while working.
6. Never switch on supply unless you are sure about working of an appliance.
7. Ensure that proper earthing is provided for the appliance.



NOTES

8. Seek guidance of your teacher in case of any doubt and do not try to experiment yourself.
9. Report any damage or breakdown to your teacher immediately.

Precautions

1. In DC measurements check polarities.
2. Select higher range for measurement initially and later select required range for accuracy.

Check Your Progress

A. Multiple choice questions

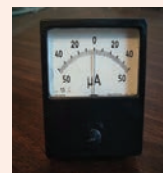
1. Which of the following is used to measure power of an electric circuit?



(a) Wattmeter



(b) Megger



(c) Ammeter

2. Which of the following is used to turn a nut or bolt?



(a) Spanner

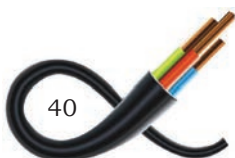


(b) Plier




(c) Cutter

3. If a worker on a live-line gets electrocuted, first _____.
 - (a) call a doctor
 - (b) switch off supply
 - (c) take the person away from the spot
 - (d) provide artificial respiration
4. Pliers are classified by their _____.
 - (a) width
 - (b) length
 - (c) nose shape and intended work
 - (d) handle



NOTES

5. This tool is known as _____.
(a) screw driver
(b) combination plier
(c) wire cutter
(d) crimping tool
- 
6. A generator provides the pressure for the electrical current to travel through electrical conductors (wires). What is this measure of electrical force called?
(a) Watts
(b) Amps
(c) Volts
(d) Current
7. When working on a circuit, use approved tools with _____.
(a) rubber gloves
(b) an International Efficiency (IE) rating
(c) insulated handles
(d) None of the above
8. If equipment has been repaired, make sure that it has been _____ as safe before using it.
(a) demonstrated
(b) listed
(c) tested and certified
(d) None of the above
9. Damaged tools must be removed from service and properly _____.
(a) repaired
(b) destroyed
(c) tagged
(d) carried

B. State whether the following statements are True or False

1. Safety glasses shall always be worn whenever you are using power hand tool.
2. Never use electric tools in wet conditions.
3. If a tool doesn't work for a particular job, you should alter it, so it does work.

